

HM 5.0a contains four Expense Modules in order to allow the user to display results by line density range, by wire center, by CBG or by cluster.⁶⁷ Each of the Expense Modules receive from the other modules all the network investments, by type of network component necessary to provide UNEs, basic universal service and network interconnection and carrier access in each study area. The Expense Modules estimate the capital carrying costs associated with the investments as well as the costs of operating this network. Capital carrying costs include depreciation, return on the debt and equity investment required to build the network and a gross-up to pay for the income taxes imposed on equity returns. Network-related operating expenses include maintenance and network operations. Non-network-related operating expenses include customer operations expenses, general support expenses, other taxes, uncollectibles and variable overhead expenses.

The Expense modules require a number of user inputs. These inputs, and their corresponding default values, appear as inputs B178-B196 in Appendix B.

⁶⁷ Although the HM 5.0a engineers no plant based on CBG granularity, the results of its engineering to individual clusters may be rolled up to display cost results at the CBG level.

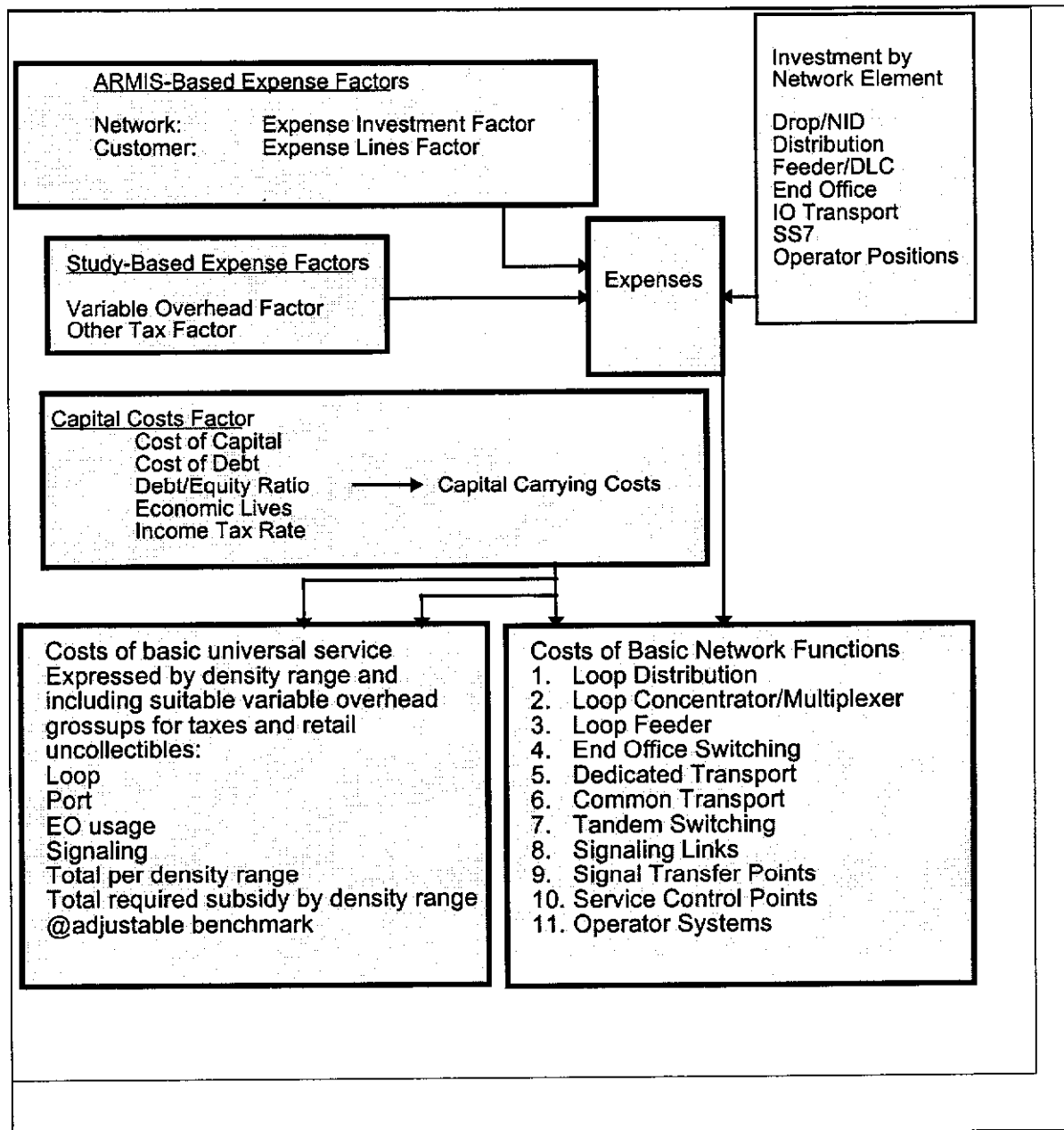


Figure 10 Expense Module Flows

6.6.2. Capital Carrying Costs

Estimating forward-looking capital carrying costs is relatively straight-forward. The FCC and state regulators have developed standard practices that are based on sound economics to perform this function. The model calculates annual capital cost for each UNE component based on:

- a) Plant investment for that component from the relevant investment modules,

- b) The return to the net asset;
- c) An income tax gross-up on the equity component of the return, and
- d) The expected service life adjusted for net salvage value (depreciation) of the component.

Each of these elements of the capital carrying cost estimate is discussed below.

The weighted average cost of capital (return) is built up from several components. A 45/55 debt/equity ratio is assumed, with a cost of debt of 7.7 percent and a cost of equity of 11.9 percent, for an overall weighted average cost of capital of 10.01 percent.⁶⁸ The equity component of the return is subject to federal, state and local income tax. As a consequence, it is necessary to increase the pre-tax return dollars, so that the after-tax return is equal to the assumed cost of capital. A user-adjustable assumed combined 39.25 percent federal, state and local income tax ("FSLIT") rate is used "gross up" return dollars to achieve this result.

The model assumes straight-line depreciation and calculates return on investment, tax gross-up and depreciation expenses annually on the mid-year value of the investment. Because capital carrying costs are levelized, substitution of nonlinear or accelerated depreciation schedules for straight-line depreciation would have only a modest net effect on calculated annual capital carrying costs (aside from favorable tax effects). Default values for the service lives of the 23 categories of equipment used in the Model are based on their average projection lives adjusted for net salvage value as determined by the three-way meetings (FCC, State Commission, LEC) for 76 LEC study areas including all of the RBOCs, SNET, Cincinnati Bell, and numerous GTE and United companies. The table below shows the plant categories, their economic lives, their percent net salvage value, and the resulting adjusted projection lives upon which depreciation is based. These economic lives and net salvage percents are user-adjustable.

⁶⁸ This assumed cost of capital is conservatively high. Current financial analyses show LEC cost of capital to range between 9 and 10 percent. See, AT&T ex parte filing of February 12, 1997, "Estimating the Cost of Capital of Local Telephone Companies for the Provision of Network Elements," by Bradford Cornell, September, 1996.

Account	USOA Category	Economic Lives	Net Salvage Percent	Adjusted Projection Lives
2112	Motor Vehicles	8.24	0.1121	9.28
2115	Garage Work Equipment	12.22	-0.1071	11.04
2116	Other Work Equipment	13.04	0.0321	13.47
2121	Buildings	46.93	0.0187	47.82
2122	Furniture	15.92	0.0688	17.10
2123.1	Office Support Equipment	10.78	0.0691	11.58
2123.2	Company Comm Equipment	7.40	0.0376	7.69
2124	Computers	6.12	0.0373	6.36
2212	Digital Switching	16.17	0.0297	16.66
2220	Operator Systems	9.41	-0.0082	9.33
2232.2	Digital Circuit Equipment	10.24	-0.0169	10.07
2351	Public Telephone	7.60	0.0797	8.26
	NID, SAI			19.29
2411	Poles	30.25	-0.8998	15.92
2421-m	Aerial Cable - Metallic	20.61	-0.2303	16.75
2421-nm	Aerial Cable - Non-Metallic	26.14	-0.1753	22.24
2422-m	Underground - Metallic	25.00	-0.1826	21.14
2422-nm	Underground - Non-Metallic	26.45	-0.1458	23.08
2423-m	Buried - Metallic	21.57	-0.0839	19.90
2423-nm	Buried - Non-Metallic	25.91	-0.0858	23.86
2426-m	Intrabuilding - Metallic	18.18	-0.1574	15.71
2426-nm	Intrabuilding - Non-Metallic	26.11	-0.1052	23.62
2441	Conduit Systems	56.19	-0.1034	50.92
	Average Metallic Cable (calculated)			19.29

Return is earned only on net capital, but because depreciation results in a declining value of plant in each year, the return amount declines over the service life of the plant. To ensure that a meaningful long run capital carrying cost is calculated, the return amount is leveled over the assumed life of the investment using net present value factors. An annual capital carrying charge factor is developed for economic depreciation lives from 1 to 80 years. (see, "CCCFactor" worksheet in the Expense Module). These factors (which are also disaggregated into their depreciation, return and tax components) are then applied to investment in each plant category (with interpolation to account for fractional year values for economic life) to determine the annual capital carrying cost for each plant category.

6.6.3. Operating Expenses

Estimating LEC operating costs is more difficult than estimating capital costs. Few publicly available forward-looking cost studies are available from the ILECs. Consequently, many of the operating cost estimates developed here must rely on relationships to and within historical ILEC cost information as a point of departure for

estimating forward-looking operating costs. While certain of these costs are closely linked to the number of lines provided by the ILEC, other categories of operating expenses are related more closely to the levels of their related investments. For this reason, the Expense Module develops factors for numerous expense categories and applies these factors both against investment levels and demand quantities (as appropriate) generated by previous modules.

The HM 5.0a density zone Expense Module now includes a USOA Detail worksheet that breaks out the HM 5.0a investments and expense results by Part 32 account for comparison with embedded ARMIS data. There is also an Expense Assignment worksheet that allows the user to vary the proportion of total expenses that are assigned to loop network elements (i.e., NID, distribution, concentration and feeder) based on relative number of lines versus based on the relative amount of direct expenses (direct expenses include maintenance expenses and capital carrying costs for specific network elements).

The operating expenses can be divided into two categories -- network related and non-network related. Network-related expenses include the cost of operating and maintaining the network, while non-network expenses include customer operations and variable overhead.

The cost categories contained in the FCC's USOA are used as the point of departure for estimating the operating expenses associated with providing UNEs, basic universal service and carrier access and interconnection. The major expense categories in the USOA are Plant Specific Operations Expense, Plant Non-Specific Operations Expense, Customer Operations Expense and Corporate Operations Expense. The first two are network-related, the latter are not.

LECs report historical expense information for each of these major categories through the FCC's ARMIS program. The ARMIS data used in the Expense Module include investment and operating expenses and revenues for a given local carrier and state. As noted above, forward-looking expense information for these categories is not publicly available from the ILECs. A variety of approaches are used to estimate the forward-looking expenses.

6.6.3.1. Network-Related Expenses

The two major categories under which network-related expenses are reported by the ILECs are plant-specific operations expenses and non plant-specific operations expenses. The plant-specific expenses are primarily maintenance expenses. Certain expenses, particularly those for network maintenance, are functions of their associated capital investments. The Expense Module estimates these from historic expense ratios calculated from balance sheet and expense account information reported in each carrier's ARMIS report. These expense ratios are applied to the investments developed by the Distribution, Feeder, and Switching and Interoffice Modules to derive associated operating expense amounts. The ARMIS information used to perform these functions is

contained in the "ARMIS Inputs" worksheet, and the expense factors are computed in the "96 Actuals" worksheet of the Expense Module.

Other expenses, such as network operations, vary more directly with the number of lines provisioned by the ILEC rather than its capital investment. Thus, expenses for these elements are calculated in proportion to the number of access lines supported.

The Expense Module estimates direct network-related expenses for all of the UNEs. These operating expenses are added to the annual capital carrying cost to determine the total expenses associated with each UNE. Each network-related expense is described below:

- a) *Network Support* -- This category includes the expenses associated with motor vehicles, aircraft, special purpose vehicles, garage and other work equipment.
- b) *Central Office Switching* -- This includes end office and tandem switching as well as equipment expenses.
- c) *Central Office Transmission* -- This includes circuit equipment expenses applied to transport investment.
- d) *Cable and Wire* -- This category includes expenses associated with poles, aerial cable, underground/buried cable and conduit systems. This expense varies directly with capital investment.
- e) *Network Operations* -- The Network Operations category includes power, provisioning, engineering and network administration expenses.

The Expense Module uses specific forward-looking expense factors for digital switching and for central office transmission equipment; these values derive from a New England Telephone cost study.⁶⁹ The Module similarly computes a forward-looking Network Operations value based on the corresponding ARMIS value. The total Network Operations expense is strongly line-dependent. The model thus computes this expense as a per-line additive value based on the reported total Network Operations expense divided by the number of access lines and deducting a user-adjustable 50 percent of the resulting quotient to produce a forward-looking estimate.

6.6.3.2. NonNetwork-Related Expenses

The Expense Module assigns non-network related expenses to each density range, census block group, or wire center (depending on the unit of analysis chosen) based on the proportion of direct expenses (network expenses and capital carrying costs) for that unit of analysis to total expenses in each category. Each of these expenses is described below:

⁶⁹ New England Telephone, 1993 New Hampshire Incremental Cost Study, Provided in Compliance with New Hampshire Public Utility Commission Order Number 20, 082, Docket 89-010/85-185, March 11, 1991.

- a) *Variable support* -- Certain costs that vary with the size of the firm, and therefore do not meet the economic definition of a pure overhead, are often included under the classification of General and Administrative expenses by ILECs. For example, if a LEC did not provide loops, it would be a much smaller company, and would therefore have lower overhead costs. Some of these costs are nonetheless attributed to overhead under current ILEC accounting procedures. Therefore, the model includes a portion of these "overhead" costs in the TSLRIC estimates.

Such variable support expenses for LECs currently are substantially higher than those of similar service industries operating in more competitive environments. Based on studies of these variable support expenses in competitive industries such as the interexchange industry, the model applies a conservative, user-adjustable 10.4 percent variable support factor to the total costs (i.e., capital costs, network-related operations expenses and non-network-related operating expenses) estimated for unbundled network elements, as well as basic local service.

- b) *General Support Equipment* -- The module calculates investments for furniture, office equipment, general purpose computers, buildings, motor vehicles, garage work equipment, and other work equipment. The Model uses actual 1996 company investments to determine the ratio of investments in the above categories to total investment. The ratio is then multiplied by the network investment estimated by the Model to produce the investment in general support equipment. The recurring costs -- capital carrying costs and operating expenses -- of these items are then calculated from the investments in the same fashion as the recurring costs for other network components. A portion of general support costs is assigned to customer operations and corporate operations according to the proportion of operating expense in these categories to total operating expense reported in the ARMIS data. The remainder of costs is then assigned directly to UNEs.
- c) *Uncollectible Revenues* -- Revenues are used to calculate the uncollectibles factor. This factor is a ratio of uncollectibles expense to adjusted net revenue. The Module computes both retail and wholesale uncollectibles factors, with the retail factor applied to basic local telephone service monthly costs and the wholesale factor used in the calculation of UNE costs.

6.6.4. Expense Module Output

The Density Zone and Wire Center expense modules display results in a series of reports which depict detailed investments and expenses for each UNE for each density zone and wire center, summarized investments and expenses for all UNEs, unit costs by UNE and total annual and monthly network costs. In addition, the UNEs are used to estimate interexchange access costs. The Density Zone, Wire Center, CBG and Cluster expense modules also calculate the cost of basic local service and universal service support across density zones, wire centers, CBGs and clusters, respectively.

6.6.4.1. UNE Outputs (Unit Cost Sheet)

The HAI Model produces cost estimates for Unbundled Network Elements that are the building blocks for all network services. The UNEs are described below.

- a) *Network Interface Device* -- This is the equipment used to terminate a line at a subscriber's premise. It contains connector blocks and over-voltage protection.
- b) *Loop Distribution* -- The individual communications channel to the customer premises originating at the SAI and terminating at the customer's premises. In the HAI Model, this UNE also includes the investments in NID, drop and terminal/splice, and for long loops, the cost of T1 electronics.
- c) *Loop Concentrator/Multiplexer* -- The DLC remote terminal at which individual subscriber traffic is multiplexed and connected to loop distribution for termination at the customer's premises. The HAI Model includes DLC equipment and SAI investment in this UNE.
- d) *Loop Feeder* -- The facilities on which subscriber traffic is carried from the line side of the end office switch to the Loop Concentration facility. The UNE includes copper feeder and fiber feeder cable, plus associated structure investments (poles, conduit, etc.)
- e) *End Office Switching* -- The facility connecting lines to lines or lines to trunks. The end office represents the first point of switching. As modeled in the HAI Model, this UNE includes the end office switching machine investments and associated wire center costs, including distributing frames, power and land and building investments.
- f) *Operator Systems* -- The systems that process and record special toll calls, public telephone toll calls and other types of calls requiring operator assistance, as well as Directory Assistance. The investments identified in the HAI Model for the Operator Systems UNE include the operator position equipment, operator tandem (including required subscriber databases), wire center and operator trunks.
- g) *Common Transport* -- A switched trunk between two switching systems on which traffic is commingled to include LEC traffic as well as traffic to and from multiple IXCs. These trunks connect end offices to tandem switches. Results are provided on a per-minute basis for the central office terminating equipment associated with the UNE, and for the transmission medium.
- h) *Dedicated Transport* -- The full-period, bandwidth-specific interoffice transmission path between LEC wire centers and an IXC POP (or other off-network location). It provides the ability to send individual and/or multiplexed switched and special services circuits between switches. Results are provided on a per-minute basis and per-channel basis for the central office terminating equipment and entrance facilities associated with the UNE, and on a per-minute and per-channel basis for the transmission medium.

- i) *Direct Transport* -- A switched trunk between two LEC end offices. Results are provided on a per-minute basis for the central office terminating equipment associated with the UNE, and on a per-minute basis for the transmission medium.
- j) *Tandem Switching* -- The facility that provides the function of connecting trunks to trunks for the purpose of completing inter-switch calls. Similar types of investments as are included in the End Office Switching UNE are also reflected in the Tandem Switching UNE.
- k) *Signaling Links* -- Transmission facilities in a signaling network that carry all out-of-band signaling traffic between end office and tandem switches and STPs, between STPs, and between STPs and SCPs. Signaling link investment is developed by the HAI Model and assigned to this UNE.
- l) *Signal Transfer Point* -- This facility provides the function of routing TCAP and ISUP messages between network nodes (end offices, tandems and SCPs). The Model estimates STP investment and assigns it to this UNE.
- m) *Service Control Point* -- The node in the signaling network to which requests for service handling information (e.g., translations for local number portability) are directed and processed. The SCP contains service logic and customer specific information required to process individual requests. Estimated SCP investment is assigned to this UNE.

6.6.4.2. Universal Service Fund Outputs (USF Sheet)

The calculation of costs for basic local service is based on the costs of the UNEs constituting this service. These are the loop, switch line port, local minute portions of end office and tandem switching, transport facilities for local traffic, and the local portions of signaling costs.⁷⁰ In addition, costs associated with retail uncollectibles, variable overheads, and certain other expenses required for basic local service, such as billing and bill inquiry, directory listings, and number portability costs, are included. No operator services or SCP costs are included. The model user has the ability to select dynamically the portions of non-traffic-sensitive UNEs to be included in the supported basic local service.

The USF report in the expense module then compares the monthly cost per line used at residence or business intensity in each density range, wire center, CBG or cluster to user-adjustable "benchmark" monthly costs for local service (which includes the End User Common Line charge). If the cost exceeds the associated benchmark, the model accumulates the total required annual support relative to stated benchmarks according to the number of primary residence lines, secondary residence lines, single line business lines, multiline business lines, or public lines by density zone, wire center, CBG or cluster (depending on the unit of analysis selected).

⁷⁰ On an optional basis, the usage sensitive cost of switched access use can be included as well.

The Density Zone USF sheet now contains separate state and federal fund calculations. These permit separate state and federal cost benchmarks; as well as the opportunity to separately specify the particular services (e.g., primary and secondary residential lines, single line business, etc.) to be supported.

6.6.4.3. Carrier Access and Interconnection (Cost Detail Sheet)

The calculation of the costs for carrier access and interconnection to the ILEC's local network are displayed in the "Cost Detail" sheet of the expense module. These costs are built up from the costs of the UNEs that constitute them. In particular, the costs of IXC switched access and local interconnection are based simply on the unit costs of EO switching, dedicated transport, common transport, tandem switching and ISUP signaling messages. In addition, the sheet also displays built up costs of various signaling services that might be used by IXCs or CLECs, as well as the costs of several forms of dedicated transport.

7. Summary

In its Release 5.0a formulation, the HAI Model reliably and consistently estimates the forward-looking economic cost of unbundled local exchange network elements, carrier access and interconnection and the forward-looking economic cost of basic local telephone service for universal service funding purposes. It uses the most accurate and granular data on actual customer locations available today, and it overlays its loop distribution network on these actual customer locations.

Because all of these calculations are performed in adherence to TELRIC/TSLRIC principles, HAI Model cost estimates provide the most accurate basis for the efficient pricing of unbundled network elements carrier access and interconnection and the calculation of efficient universal service funding requirements.

Like its predecessor, the HM 5.0a methodology is open to public scrutiny. To the extent possible, it uses public source data for its inputs. When documentable public source data is lacking, these default input values represent the developers' best judgments of efficient, forward-looking engineering and economic practices. In addition, because these inputs are adjustable users of HM 5.0a can use the model's automated interface to model directly and simply any desired alternative.

Appendix A

History of the Hatfield/HAI Model

History of the Hatfield/HAI Model

The Hatfield/HAI Model was originally developed to produce estimates of the TSLRIC of basic local telephone service as part of an examination of the cost of universal service. This original model was a "greenfield" model in that it assumed all network facilities would be built without consideration given to the location of existing wire centers. When the original Benchmark Cost Model ("BCM1")¹ became available, HAI revised the original Hatfield Model to incorporate certain loop investment data produced by BCM1. As a result, the Hatfield Model adopted BCM1's "scorched node" methodology of assuming that network wire centers will remain at their current locations. Investment outputs from the BCM1 loop modeling process, substantially modified by including the cost of items that were not included in the BCM1, were then combined with extensive wire center and interoffice and expense calculations enhanced from the earlier Hatfield Model to develop a complete set of TSLRIC estimates for basic local service.

An expanded version of earlier Hatfield Models, referred to as the Hatfield Model, Version 2.2, Release 1, was developed early in 1996 to estimate the costs of unbundled network elements. It was submitted to the Federal Communications Commission ("FCC") in CC Docket No. 96-98 on May 16 and 30, 1996, accompanied by descriptive documentation.² On July 3, 1996, that model was also placed into the record of CC Docket No. 96-45 to assist the Commission in determining the forward-looking economic costs of universal service.³

Further enhancements to this model were contained in the Hatfield Model, Version 2.2, Release 2 ("HM 2.2.2"). This version of the model estimated the efficient, forward-looking economic cost of both unbundled network elements and basic local telephone service. HM 2.2.2 derived certain of its inputs and methods from the BCM-PLUS model, a derivative of BCM1 that was developed and copyrighted by MCI Telecommunications Corporation.

¹ The Benchmark Cost Model is a model of basic local telephone service that was developed by MCI, NYNEX, Sprint, and U S WEST.

² See Appendix E of the *Comments* of AT&T in CC Docket No. 96-98, In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, and Appendix D of AT&T's *Reply Comments*. In the same proceeding, MCI submitted results based on an earlier "greenfield" version of the Model as Attachment 1 to its *Comments*.

³ See FCC Public Notice, DA-96-1078, Released July 3, 1996 and DA 1094, Released July 10, 1996 ("Cost Model Public Notice").

On August 8, 1996, the FCC released its First Report and Order in CC Docket No. 96-98, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, and CC Docket No. 95-185, Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers ("Interconnection Order"). The Interconnection Order provided a comprehensive set of criteria for the arrangements through which the incumbent Local Exchange Carriers (ILECs) would offer unbundled network elements to competitive local exchange carriers (CLECs). The criteria included a definition of a cost-based methodology that should be used in setting the price of unbundled network elements. The methodology was termed the "Total Element Long Run Incremental Cost," or TELRIC. The methodology of the Hatfield Model is fully consistent with the TELRIC principles set forth in the Interconnection Order for calculating the cost of UNEs, and with TSLRIC principles for calculating the cost of Basic Local Service.

AT&T and MCI used HM 2.2.2 as the basis for their recommended prices for unbundled network elements in a large number of state jurisdictions during the latter part of 1996. Its results were adopted in whole or in part in several of these proceedings. In the process, the Model was subject to thorough examination by the ILECs, state commission staffs, and other parties. This scrutiny, along with ongoing intense internal reviews, provided valuable insights into further desirable enhancements to the Model.

On November 8, 1996, the Joint Board issued its Recommended Decision in CC Docket No. 96-45.⁴ In addition to defining Universal Service, the Board also addressed the issue of determining the level of support required for universal service. In doing so, it found that:

... a properly crafted proxy model can be used to calculate the forward-looking economic costs for specific geographic areas, and be used as the cost input in determining the level of support a carrier may need to serve a high cost area. The Joint Board therefore recommends that the Commission continue to work with the state commissions to develop an adequate proxy model that can be used to determine the cost of providing supported services in a particular geographic area . . .⁵

An in-depth review of these issues was also provided in the Competitive Pricing Division Staff Analysis of "The Use of Computer Models for Estimating Forward-Looking Economic Costs."⁶ Further suggestions for the improvement of proxy models were advanced at workshops conducted by the FCC in cooperation with the Joint Board staff on January 14 and 15, 1997. Although the FCC and state staffs declined at that time to

⁴ Op. cit., Recommended Decision.

⁵ Ibid., paragraph 268.

⁶ Released January, 9, 1997.

recommend any particular proxy model, these workshops provided an extensive review of the existing models, and established a number of criteria these models should meet.⁷

On February 7, 1997, AT&T and MCI submitted to the Joint Board a preliminary version of a new release of the Hatfield Model, Release 3.0, with accompanying documentation. The submission included data and results for five states: California, Colorado, New Jersey, Texas, and Washington.⁸ HM 3.0 addressed the concerns raised by the Joint Board in its consideration of proxy cost models and the FCC in its consideration of modeling the forward looking economic cost of interconnection. It was responsive to the principles established and concerns raised about existing models, in the Interconnection Order, the Joint Board Recommendation and in Staff Papers and Workshops.

Later the same month, on February 28, AT&T and MCI submitted Hatfield Model Release 3.1 (HM 3.1). It incorporated certain minor modifications to HM 3.0; further, it contained data for 49 states plus the District of Columbia.

In April, 1997, the state members of the Universal Service Joint Board issued several proxy cost modeling reports. Although these reports provided useful analyses of desired features within the models, they came to no clear final conclusion on the choice of a model.

⁷ Ibid., paragraphs 273-277 and Appendix F.

⁸ Results from Release 3.0 were submitted in three state proceedings: Kansas, Virginia, and Washington.

Appendix B

HM 5.0a Inputs, Assumptions and Default Values

Appendix B – HAI Model Release 5.0a Inputs, Assumptions and Default Values

This appendix provides a list of the HAI Model Release 5.0a user inputs, as well as their definitions and the default values set in the model. The Appendix is organized based on the series of user input dialogue boxes that are used to set parameters in the HAI Model interface. This yields the following hierarchy:

Input Parameter Category (distribution, feeder, wire center, expense, and excavation)
 Category dialogue box (NID, drop, switching parameters, etc.)
 User Input field (fiber strands per remote terminal, etc.)

The appendix is organized into two sections. The first contains the index of dialogue boxes and specific user input fields. The second lists the inputs with their definitions and default values. These are numbered sequentially from B1 through B201. To facilitate cross-referencing between the two sections, each user-input field in the first section contains a numbered entry from the second section. Thus, for instance, the "B1" next to the Residential NID Materials, No Protector entry refers to the first item in the second section of the appendix.

With this organization, the appendix allows a user who is examining a given user input dialogue box and specific user input field to locate that box/field in the index in the first section, read the number of the corresponding input definition, and use that number to locate the input definition and default value in the second section.

Note that a few parameters are set in one module but used by several modules. In such cases, the parameter appears only once, but its use in other modules is noted at the end of each input parameter category in this index.

PART 1: INDEX OF DIALOGUE BOXES AND USER INPUT FIELDS

Distribution

NID

B1	Residential NID Case, no protector
B1	Residential NID Basic Labor
B1	Residential Protection Block, per pair
B1	Business NID Case, no protector
B1	Business NID Basis Labor
B1	Business Protection Block, per pair
B1	Indoor NID Case

Drop

B2	Drop Distance
B3	Aerial Drop Installation, total
B3	Buried Drop Installation/foot
B4	Buried Drop Sharing Fraction
B5	Buried Drop Fraction
B6	Average Lines Per Business Locations
B7	Buried Terminal and Splice per Line
B7	Aerial Terminal and Splice per Line
B8	Buried Drop Investment per Foot
B8	Aerial Drop Investment per Foot
B8	Buried Pairs
B8	Aerial Pairs

Cable and Riser Investment

B9	Distribution Cable Size
B10	Distribution Cable, \$/foot
B11	Riser Cable Size
B11	Riser Cable, \$/foot

Poles and Conduit

B12	Pole Investment
B12	Pole Labor
B13	Buried Cable Sheath Multiplier
B14	Conduit Investment per Foot
B15	Spare Tubes per Route
B16	Regional Labor Adjustment Factor (Note: This parameter can now be found after the Excavation and Restoration section, at the end of this document.)

Placement Fraction

B17	Aerial Fraction
B17	Buried Fraction
B17	Underground Fraction
B17	Buried Fraction Available for Shift

Cable Sizing Factors and Pole Spacing

B18	Cable Sizing Factors
B19	Pole Spacing

Geology and Clusters

B20	Difficult Terrain Distance Multiplier
B21	Rock Depth Threshold, inches
B22	Hard Rock Placement Multiplier
B23	Soft Rock Placement Multiplier
B24	Sidewalk / Street Fraction
B25	Maximum Analog Copper Total Distance
B26	Feeder Steering Enable
B27	Maximum Feeder Route/Air Multiplier
B27a	Require Serving Areas to be Square

Long Loop Investments

B28	T1 Repeater Investments, Installed
B29	CO Mux Capacity, Installed
B30	RT Cabinet & Common Equipment, Installed
B31	T1 Channel Unit Investment per Subscriber
B32	COT Investment per RT, Installed
B33	T1 Remote Terminal Fill Factor
B34	Maximum T1s per Cable
B35	T1 Repeater Spacing
B36	Aerial T1 Attenuation
B37	Buried T1 Attenuation

SAI Investment

B38	Cable Size
B38	Indoor SAI
B38	Outdoor SAI

Dedicated Circuit Inputs

B39	Percentage of Dedicated Circuits
B40	Pairs per Dedicated Circuit

Wireless Investment

B41	Wireless Investment Cap Enable
B42	Wireless Point to Point Investment Cap - Distribution
B43	Wireless Common Investment
B44	Wireless Per Line Investment
B45	Maximum Broadcast Lines per Common Investment

Feeder

Copper Placement

B46	Aerial Fraction
B46	Buried Fraction
B46	Underground Fraction
B47	Manhole Spacing, /ft.
B48	Pole Spacing, ft.
B49	Pole Materials

B49	Pole Labor
B50	Inner Duct Investment per Foot

Fiber Placement

B51	Aerial Fraction
B51	Buried Fraction
B51	Underground Fraction
B51	Buried Fraction Available for Shift
B52	Pullbox Spacing, ft.
B53	Buried Fiber Sheath Addition per Foot

Cable Sizing Factors

B54	Copper Feeder Cable Sizing Factors
B55	Fiber Feeder Cable Sizing Factor

Cable Costs

B56	Copper Investment per foot
B56	Copper Investment per Pair-foot
B57	Fiber Investment per foot
B57	Fiber Investment per Strand-foot

DLC Equipment

B58	High Density DLC Remote Terminal – Site and Power
B58	Low Density DLC Remote Terminal – Site and Power
B59	High Density DLC Remote Terminal – Maximum Lines
B59	Low Density DLC Remote Terminal – Maximum Lines
B60	High Density DLC Remote Terminal – RT Fill Factor
B60	Low Density DLC Remote Terminal – RT Fill Factor
B61	High Density DLC Remote Terminal – Common Equipment Investment
B61	Low Density DLC Remote Terminal – Common Equipment Investment
B62	High Density DLC Remote Terminal – POTS Channel Unit Investment
B62	Low Density DLC Remote Terminal – POTS Channel Unit Investment
B62	High Density DLC Remote Terminal – Coin Channel Unit Investment
B62	Low Density DLC Remote Terminal – Coin Channel Unit Investment
B63	High Density DLC Remote Terminal – POTS Lines per CU
B63	Low Density DLC Remote Terminal – POTS Lines per CU
B63	High Density DLC Remote Terminal – Coin Lines per CU
B63	Low Density DLC Remote Terminal – Coin Lines per CU
B64	LD Crossover Lines
B65	High Density DLC Remote Terminal – Fibers per RT
B65	Low Density DLC Remote Terminal – Fibers per RT
B66	High Density DLC Remote Terminal – Optical Patch Panel
B66	Low Density DLC Remote Terminal – Optical Patch Panel
B67	Copper Feeder Max Distance, ft
B68	High Density DLC Remote Terminal – Common Equipment Investment per 672 Lines
B68	Low Density DLC Remote Terminal – Common Equipment Investment per 120 Lines
B69	High Density DLC Remote Terminal – Number of Max Line Modules / RT
B69	Low Density DLC Remote Terminal – Number of Max Line Modules /

RT

Copper Manhole Investment

B70	Materials
B70	Frame and Cover
B70	Site Delivery
B70	Excavate and Backfill
B71	Dewatering Factor for Manhole Placement
B72	Water Table Depth for Dewatering

Fiber Pullbox Investment

B73	Materials
B73	Installation

Note: The Feeder Module also uses inputs B13-B15.

Switching and Interoffice Transmission

End Office Switching

B74	Real time (BHCA)
B75	Traffic (BHCCS)
B76	Switch maximum line size
B77	Switch port administrative fill
B78	Switch maximum processor occupancy
B79	MDF/protector investment per line
B80	Analog line circuit offset of DLC per line
B81	Switch installation multiplier
B82	End Office Switching Investment Constant – BOC and Large ICO
B82	End Office Switching Investment Constant – Small ICO
B83	End Office Switching Investment Slope Term
B84	Processor Feature Loading Multiplier - Normal
B84	Processor Feature Loading Multiplier - Heavy business
B85	Processor Feature Loading Multiplier - Business penetration threshold

Wire Center

B86	Lot size, multiplier of switch room size
B87	Tandem/EO common factor
B88	Power
B89	Switch Room Size, square ft.
B90	Construction, square ft.
B91	Land, square ft.

Traffic Parameters

B92	Local Call Attempts
B93	Call Completion Factor
B94	IntraLATA Calls Completed
B95	InterLATA Intrastate Calls Completed
B96	InterLATA Interstate Calls Completed
B97	Local DEMs, thousands
B98	Intrastate DEMs, thousands

B99	Interstate DEMs, thousands
B100	Local Business/Residential DEMs
B101	Intrastate Business/Residential DEMs
B102	Interstate Business/Residential DEMs
B103	BH Fraction of Daily Usage
B104	Annual to Daily Usage Reduction Factor
B105	Residential Holding Time Multiplier
B105	Business Holding Time Multiplier
B106	Residential Call Attempts/BH
B106	Business Call Attempts/BH

Interoffice Investment

B107	OC-48 ADM, installed, 48 DS-3s
B107	OC-48 ADM, installed, 12 DS-3s
B107	OC-3/DS-1 Terminal Multiplexer, installed, 84 DS-1s
B107	Investment per 7 DS-1s
B108	Number of Fibers
B109	Pigtail Investment
B110	Optical Distribution Panel
B111	EF&I, per hour
B112	EF&I, hours
B113	Regenerator, installed
B114	Regenerator Spacing, miles
B115	Channel Bank Investment/24 lines
B116	Fraction of SA lines requiring multiplexing
B117	Digital Cross Connect System, installed per DS3
B118	Transmission Terminal Fill (DS-0 level)
B119	Fiber Cable
B120	Number of Strands per ADM
B121	Buried Fraction
B121	Aerial Fraction
B122	Buried Placement
B122	Conduit Placement
B123	Buried Sheath Addition
B124	Conduit
B125	Pullbox Spacing
B126	Spare Tubes per route
B126	Pullbox Investment
B127	Pole Spacing, ft.
B128	Pole Material
B128	Pole Labor
B129	Fraction of poles and buried/underground placement common with feeder
B130	Fraction of aerial structure assigned to telephone
B130	Fraction of buried structure assigned to telephone
B130	Fraction of underground structure assigned to telephone

Transmission Parameters

B131	Operator Traffic Fraction
B132	Total Interoffice Traffic Fraction
B133	Maximum Trunk Occupancy, CCS
B134	Trunk Port, per end
B135	Direct Routed fraction of local interoffice

B136	Tandem Routed fraction of intraLATA traffic
B137	Tandem Routed fraction of interLATA traffic
B138	POPs per Tandem Location
B139	Threshold Value for Off-Ring Wire Centers
B140	Remote – Host Fraction of Interoffice Traffic
B141	Host – Remote Fraction of Interoffice Traffic
B142	Maximum Nodes per Ring
B142a	Ring Transiting Traffic Factor
B142b	Intertandem Fraction of Tandem Trunks

Tandem Switching

B143	Real Time Limit, BHCA
B144	Port Limit, trunks
B145	Common Equipment Investment
B146	Maximum Trunk Fill
B147	Maximum Real Time Occupancy
B148	Common Equipment Intercept Factor
B149	Entrance Facility Distance from Serving Wire Center & IXC POP

Signaling

B150	STP Link Capacity
B151	STP Maximum Fill
B152	STP investment, per pair, maximum
B153	STP investment, per pair, minimum
B154	Link Termination, both ends
B155	Signaling Bit Rate
B156	Link Occupancy
B157	C Link Cross Section
B158	ISUP Messages per interoffice BHCA
B159	ISUP Messages length, bytes
B160	TCAP Messages per transaction
B161	TCAP Message Length, bytes
B162	Fraction of BHCA requiring TCAP
B163	SCP investment/transaction/second

OS and Public Telephone

B164	Investment per position
B165	Maximum Utilization per position, CCS
B166	Operator Intervention Factor
B167	Public Telephone Equipment Investment, per station

ICO Parameters

B168	ICO STP Investment per line, Equipment
B169	ICO Local Tandem Investment per line, Equipment
B170	ICO OS Tandem Investment per line, Equipment
B171	ICO SCP Investment per line, Equipment
B172	ICO STP/SCP Wire Center Investment per line
B173	ICO Local Tandem Wire Center Investment per line
B174	ICO OS Tandem Wire Center Investment per line
B175	ICO C-Link / Tandem A-Link Investment per line
B175a	Equivalent Facility Investment per DS0
B175b	Equivalent Terminal Investment per DS0

Host / Remote Assignment

B176	Host – Remote CLLI Assignments
B177	Host – Remote Assignment Flag

Host / Remote Investment

B177a	Line Size Designation
B177b	Fixed and per Line Investment

Expense

Cost of Capital

B178	Cost of Debt
B178	Debt Fraction
B178	Cost of Equity

Depreciation and Net Salvage

B179	Motor Vehicles
B179	Garage Work Equipment
B179	Other Work Equipment
B179	Buildings
B179	Furniture
B179	Office Support Equipment
B179	Company Comm. Equipment
B179	General Purpose Computer
B179	Digital Electronic Switching
B179	Operator Systems
B179	Digital Circuit Equipment
B179	Public Telephone Terminal Equipment
B179	Poles
B179	Aerial Cable – metallic
B179	Aerial Cable – non metallic
B179	Underground Cable – metallic
B179	Underground Cable – non metallic
B179	Buried Cable – metallic
B179	Buried Cable – non metallic
B179	Intrabuilding Cable – metallic
B179	Intrabuilding Cable – non metallic
B179	Conduit Systems

Expense Assignment

B179a	Furniture – Capital Costs
B179a	Furniture – Expenses
B179a	Office Equipment – Capital Costs
B179a	Office Equipment – Expenses
B179a	General Purpose Computer – Capital Costs
B179a	General Purpose Computer – Expenses
B179a	Motor Vehicles – Capital Costs
B179a	Motor Vehicles – Expenses
B179a	Buildings – Capital Costs
B179a	Buildings – Expenses

B179a	Garage Work Equipment – Capital Costs
B179a	Garage Work Equipment – Expenses
B179a	Other Work Equipment – Capital Costs
B179a	Other Work Equipment – Expenses
B179a	Network Operations
B179a	Other Taxes
B179a	Variable Overhead

Structure Fraction Assigned to Telephone

B180	Distribution Aerial
B180	Distribution Buried
B180	Distribution Underground
B180	Feeder Aerial
B180	Feeder Buried
B180	Feeder Underground

Other

B181	Income Tax Rate
B182	Corporate Overhead Factor
B183	Other Taxes Factor
B184	Billing/Bill Inquiry per line per month
B185	Directory Listing per line per month
B186	Forward-looking Network Operations Factor
B187	Alternative CO Switching Factor
B188	Alternative Circuit Equipment Factor
B189	EO Non Line-Port Cost Fraction
B190	Per line monthly LNP cost
B191	Carrier – Carrier Customer Service, per line per year
B192	NID Expense per line per year
B193	DS-0/DS-1 Terminal factor
B194	DS-1/DS-3 Terminal factor
B195	Average Lines per Business Location
B196	Average Trunk Utilization

Excavation and Restoration

Underground Excavation

B197	Trenching, per Foot
B197	Backhoe Fraction
B197	Backhoe Cost, per Foot
B197	Hand Trench Fraction
B197	Hand Trench Cost per Foot

Underground Restoration

B198	Cut/Restore Asphalt Fraction
B198	Cut/Restore Asphalt, per Foot
B198	Cut/Restore Concrete Fraction
B198	Cut/Restore Concrete, per Foot
B198	Cut/Restore Sod Fraction
B198	Cut/Restore Sod, per Foot
B198	Simple Backfill, per Foot

B198	Pavement, per Foot
B198	Dirt, per Foot

Buried Excavation

B199	Plow Fraction
B199	Plow per Foot
B199	Trench per Foot
B199	Backhoe Fraction
B199	Backhoe, per Foot
B199	Hand Trench Fraction
B199	Hand Trench, per Foot
B199	Bore Cable Fraction
B199	Bore Cable, per Foot

Buried Installation and Restoration

B200	Push Pipe/Pull Cable Fraction
B200	Push Pipe/Pull Cable per Foot
B200	Cut/Restore Asphalt Fraction
B200	Cut/Restore Asphalt, per Foot
B200	Cut/Restore Concrete Fraction
B200	Cut/Restore Concrete, per Foot
B200	Cut/Restore Sod Fraction
B200	Cut/Restore Sod, per Foot
B200	Restoral Not Required
B200	Simple Backfill

Surface Texture

B201	Percent of cluster Likely Affected and Effect of Texture Code
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Labor Adjustment Factors

Labor Adjustment Factor

B16	Regional Labor Factor
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Labor Adjustment Factor Weightings

B16a	Contractor Excavation and Restoration
B16a	Telco Construction - Copper
B16a	Telco Construction - Fiber
B16a	Telco Drop/NID Installation and Maintenance
B16a	Contractor Pole Setting

PART 2: INPUT PARAMETER DEFINITIONS AND DEFAULT VALUES

DISTRIBUTION INPUT PARAMETERS

NETWORK INTERFACE DEVICE

B1. NID Investment per line

Definition

The investment in the components of the network interface device (NID), the device at the customers' premises within which the drop wire terminates, and which is the point of subscriber demarcation. The NID investment is calculated as the cost of the NID case plus the product of the protection block cost per line and the number of lines terminated.

Default Values

NID Materials and Installation	
	Costs
Residential NID case, no protector	\$10.00
Residential NID basic labor	\$15.00
Installed NID case	\$25.00
Protection block, per line	\$4.00
Business NID case, no protector	\$25.00
Business NID basic labor	\$15.00
Installed NID case	\$40.00
Protection block, per line	\$4.00
Indoor NID Case	\$5.00

DROP

B2. Drop Distance

Definition

The average length of a drop cable in each of nine density zones. The drop extends from the NID at the customer's premises to the block terminal at the distribution cable that runs along the street or the lot line.

Default Values

Drop Distance by Density	
Density Zone	Drop Distance, feet
0-5	150
5-100	150
100-200	100
200-650	100
650-850	50
850-2,550	50
2,550-5,000	50
5,000-10,000	50
10,000+	50

B3. Drop Placement, Aerial and Buried

Definition

The total placement cost by density zone of an aerial drop wire, and the cost per foot for buried distribution cable placement, respectively.

Default Values

Drop Placement, Aerial & Buried		
Density Zone	Aerial, total	Buried, per foot
0-5	\$23.33	\$0.60
5-100	\$23.33	\$0.60
100-200	\$17.50	\$0.60
200-650	\$17.50	\$0.60
650-850	\$11.67	\$0.60
850-2,550	\$11.67	\$0.60
2,550-5,000	\$11.67	\$0.75
5,000-10,000	\$11.67	\$1.50
10,000+	\$11.67	\$5.00

B4. Buried Drop Sharing Fraction

Definition

The fraction of buried drop cost that is assigned to the telephone company. The other portion of the cost is borne by other utilities.

Default Value

Buried Drop Sharing Fraction	
Density Zone	Fraction
0-5	.50
5-100	.50
100-200	.50
200-650	.50
650-850	.50
850-2,550	.50
2,550-5,000	.50
5,000-10,000	.50
10,000+	.50

B5. Drop Structure Fractions

Definition

The percentage of drops that are aerial and buried, respectively, as a function of density zone.

Default values

Drop Structure Fractions		
Density Zone	Aerial	Buried
0-5	.25	.75
5-100	.25	.75
100-200	.25	.75
200-650	.30	.70
650-850	.30	.70
850-2,550	.30	.70
2,550-5,000	.30	.70
5,000-10,000	.60	.40
10,000+	.85	.15

B6. Number of Lines per Business Location

Definition

The average number of business lines per business location, used to calculate NID and drop cost. This parameter should be set the same as Parameter B195.

Default Value

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